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Air Quality Indicators

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CONTENTS

1 INTRODUCTION

Several attempts have been made to produce general air pollution indicators or air quality indexes. These index values have included a mixture of different pollutants added together to represent a measure for the total air pollution load. As one general indicator for air quality they have not been widely accepted, however.

There is a need to establish an air quality indicator or indicators to simplify the large amount of technical data presented to decision makers and to the public. Such indicators are needed also for trend analyses and comparisons between measurements performed in different cities, regions and in different countries of the world.

One goal for establishing a set of indicators is to assess the air quality as measured or estimated in relation to effects such as impact on human health, flora, fauna and materials. Such a set of indicators or parameters should be used in a simplified scheme, which is understandable and can be applied in interpretation of monitoring programmes.

To define the criteria for selection of environmental indicators for air quality classification a variety of factors has to be taken into account such as:

- Air pollution conditions, dependent upon emission source types, meteorological conditions, scale of the problem and season.
- Data availability, measurement methods and available air pollution monitoring programmes.
- Air pollution effects on human health, flora, fauna and building materials.

Some of these aspects are briefly outlined in the following.

2 BACKGROUND FOR THE SELECTION OF AQIs

2.1 THE AIR POLLUTION CONDITION

The air pollution load is a function of several different factors which also might influence the selection of relevant indicators. The type of air pollution source, meteorological and climatological conditions, topographical features, scales in space and time are some of these factors.

2.1.1 Emission source type

The type of air pollutants, the release configuration and the environmental impact strongly varies dependent upon the type of sources in question. Natural sources, sources of agricultural activities, air pollution from industry and energy production and emissions from transport systems all represent different source types and they result in environmental impact and implications on different scales.

2.1.2 Meteorological conditions

Dispersion conditions varies with meteorological parameters as wind directions, wind speed, turbulence, stability and mixing heights and also with surface conditions, surface inhomogenities and topography. In some areas adverse meteorological conditions are more decisive for high air pollution impact than the emission rates.

High pressure situations with elevated inversions due to subsidence and low wind conditions at the surface has been known for decades to produce air pollution episodes in Europe. Also calm conditions with surface based winter type inversions have been the reason for exceedance of existing air quality standards in many cities.

2.1.3 Topographical features

Topographical features might influence the meteorological and climatological condition in a specific area and also influence the dispersion conditions to yield high air pollution impact in certain areas.

2.1.4 Scale in space and time

Air pollution levels and impacts varies considerably from microscale problems in street canyons to global air pollution problems. Typical scales described by different areas is given in Table 1.

Table 1: Air pollution scales, air pollution levels and typical effects.

Area	Size (km)	Typical concentrations ($\mu g/m^3$)	Typical effects of concern
Street	0,01	100- 1 000	Acute health effects
City blocks	0,1-1	20-500	Health, Discomfort
Local	1-10	10-100	Health, Materials,
Regional	~100	5-50	Acid precipitation, Vegetation
Continental	~1 000	1-10	Acid precip., Forest damage
Global	~10 000	<1	Climatic change, Ozone depletion

2.1.5 Season

Seasonal variations in climate and dispersion conditions together with variations in insolation, surface conditions and biota yield that different pollutants play different roles during summer and winter. The most interesting components, receptors, effects, and averaging time might vary from winter to summer, e.g. SO_2 and aerosols give impacts to human health during several days of urban winter episodes, whereas high short term (one hour) ozone maxima during high pressure summer conditions might give rise to vegetation damage.

2.2 AVAILABLE DATA, MEASUREMENT PROGRAMMES

2.2.1 Measurement equipment and methods

Classification of air quality through AQI has to rely upon measured data. The quality of use of AQI is dependent upon measurement equipment and methods available.

When selecting and using air quality indicators one has to ensure that:

- Sensors are available for the specified pollutant,
- the time resolution is adequate,
- sensor locations are representative for the problem in question,
- the equipment has been proved operative during all conditions relevant,
- simplifications satisfy user qualifications and requirements,
- analytical methods are calibrated and controlled,
- quality assurance routines are implemented.

2.2.2 Air pollution monitoring programmes

Air pollution monitoring programmes are being conducted at different scales in most countries. These programmes include:

- Surveilling impact from local industry,
- local community or urban air pollution monitoring,
- national surveillance for urban and suburban areas,
- national monitoring in remote background areas,
- international programmes for urban and rural areas,

- international programmes for regional and long range transport of air pollutants,
- national and international programmes for global air pollution studies.

Some of these programmes are linked to air pollution transport and dispersion models where local, regional and global meteorological and climatological data together with emission inventories represent the input. The models can produce concentration distributions on the different scales.

The air pollutants considered in each of these programmes have been selected dependent upon the problem that is being addressed.

2.2.3 Urban, residential and industrial areas

In the monitoring programmes conducted in cities, residential areas and in industrial areas, five air pollutants have been extensively studied. These pollutants are usually emitted in large quantities and they are known to cause health effects at commonly occurring levels. The pollutants are:

- Sulphur dioxide (SO_2)
- Suspended particulate matter (SPM)
- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)
- Lead (Pb)

The main source of these pollutants is fuel combustion both by home heating, industry and vehicles. Several indicators have been used for particles in the air (SPM). The simplest one to measure has been black smoke or soot by reflectrometic methods (OECD). At present particles are often measured by two-stage filter samplers or impactors deviding the particles into sizes with diameter less than 10 micrometre (μm) (PM 10) (inhalable particles) or less than 2.5 μm (respirable particles).

The representativity of sampling site locations are in some cases controlled by the use of source oriented dispersion models or source receptor models. The possibility of classifying the air pollution situation increases considerably by the additional use of models.

2.2.4 Rural and background areas

In rural and background areas components, sampling times and frequencies as well as requirements for detection levels and accuracies are different from those in urban areas. Typical compounds investigated in background area programmes are:

Aerosols (SO_4^{2-}, NH_4^+, NO_3^-)	EMEP, BAPMoN
SO_2	EMEP, CODABQ
SPM	BAPMoN, CODABQ
Ozone	EMEP, CODABQ, TOR
NO_2	EMEP, CODABQ, TOR
Precipitation chemistry	EMEP, BAPMoN
Toxic metals	CODABQ
C_2-C_9 hydrocarbons	TOR

Sampling methods and analytical methods might vary from one programme to another. The implementation of quality control routines and follow up has shown a substantial variation in data quality.

2.2.5 Global air pollution

The focus on global air pollution problems has increased the last years. Examples of particular importance are:

- Global warming and greenhouse gases (CO_2, CH_4, CFC particles).

- Stratospheric ozone depletion (Ozone, column density, CFC, N_2O,).
- Long lived toxic micro pollutants (PCB, DDT, pesticides).

At the Norwegian global air pollution research station at Ny-Ålesund (79^0N, 475 m a.s.l) all these parameters are measured together with sulphur and nitrogen compounds in long range transported air masses.

2.3 AIR POLLUTION IMPACT

The most important requirement for the selection of air quality indicators should be a consideration of potential effects of the various air pollutants on:

- health and the well being of humans,
- flora and fauna,
- materials (building stock and monuments)

The time scale is again of great importance. Short term acute toxicity represented by very high concentrations over short periods of time, often linked to accidental releases or conditions leading to air pollution episodes, acts differently from long term chronic exposure. The latter type is often connected to deposition, uptake and intake over time. Different pollutants have to be considered on the different scales in time and space.

2.3.1 Human health

Human exposure to air pollution usually concerns a mixture of different pollutants from different sources. It has thus been difficult to establish reliable dose/response relationships from actual field data. Interesting results have resently been presented from a study on the health impact of traffic air pollution in Norway (Clench-Aas et al., 1991).

From more than one thousand persons followed through diaries and questionnaires the statistical analyses indicated that various symptoms of health and well being were correlated to exposures to traffic pollution equivalent to NO_2 levels even less than 200 $\mu g/m^3$ as a one hour average. Headaces, coughing, eye irritations, throat problems and depression were some of the symptoms asked for.

The best available background material for evaluation of health impacts is the US-EPA criteria documents and the air quality guidelines (AQG) for Europe (WHO, 1987). This AQG is formulated to ensure that populations exposed to concentrations lower than the guideline values should not suffer harmful effects. In cases where the guideline for a pollutant is exceeded, the probability of harmful effects will increase.

There are also several national standards or proposed guidelines available related to human health impact. Some of these are also under revision.

2.3.2 Flora and fauna

The air quality guidelines should also have been extended to represent the potential impact on vegetation and animals.

Studies of plant damage and air pollution impact on plant growth have been performed for several individual air pollutants and for air pollution mixtures. In the discussion of specific indicators we will have to take into consideration recent scientific results on plant damage.

Also the consideration of critical loads should be taken into account. The critial load values is defined as a quantitative estimate of the exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.

The critical load for a given area depends strongly upon geology, vegetation and soil properties. It might thus be difficult to generalize. However, for acid deposition compounds and ozone a considerable step forward has been made during the last two years. A map for the exceedance of critical loads for the fresh water system in Southern Norway was presented in 1990.

The impact on animals is often linked to uptake, intake and food chain processes. Effects of specific toxic substances, especially some toxic heavy metals, long lived chlorinated compounds, organic compounds and fluorides might be of interest. None of these compounds have, however, been included in the list of AQI in this paper. For further evaluation some of them might be of importance.

2.3.3 Building materials

The concern for our cultural heritage and for the general life time of building and constructions have increased during the last few years. Considerations for this part of our environment and for the cost of restoration and rebuilding, should be built into the air quality levels when considering air pollution indicators.

As for human health the impact is usually a result of mixtures of compounds included air pollution, climate, weathering, wind, humidity, temperature, errosion, freezing, etc.

Dose response relationships have been established for a few specific air pollutants. For SO_2 these data have been used in cost/benefit analyses for sulphur-reduction measures linked to the use of fuel oil in Europe.

3 AIR QUALITY INDICATORS

A large set of air quality indicators can be proposed for different purposes and for application on different scales The indicators to be selected for future use have to be linked to measurement methods (sensors and analyses) and to future monitoring systems. This is of importance in the development of control programmes and for international harmonization of monitoring and surveillance programmes.

We do not believe that the establishment of one air quality index, in which several air pollutants are merged into one index value, will be to the advantage for the users. This one number might mask variations and trends in single component pollutants which can be significant to air pollution impacts. The following section will therefore outline a set of single parameters that can be used as air quality indicators for urban, regional and global air pollution problems.

Table 2: A set of parameters relevant for different scales of the air pollution problem.

Area	Compound	Effect	Averaging time *)
Urban	SO_2	Health	1 h, 24 h, 6 months
	NO_2	"	1 h, 24 h
	CO	"	1 h, 8 h
	Black smoke	"	24 h
	PM10	"	24 h
	O_3	"	1 h
	Heavy metals	"	24 h 1 month
	Dust fall	Estetics	1 month
Regional	O_3	Vegetation	1 h - 8 h
	NO_2	"	24 h
	SO_2	"	24 h
	HNO_3	Acid prec.	24 h
	NH_3	Nutrient	
	Aerosols	cycles in	24 h
	Prec. chem.	unbalance	
Global	CO_2	Climate	24 h
	CH_4	"	24 h
	O_3-total	Ozone layer	Daily
	CFC	"	"
	PCB	Health	

*) Relevant for assessment

3.1 SELECTION OF AQI

The selection of parameters should be based upon an analysis of the specific problems in the area which is to be considered. The selection has to be based upon the type of emissions, available measurement data and criteria for air pollution impact on health, vegetation or materials. The averaging times to be considered should be in accordance to those given by the air quality standards, and should also be relevant to potential impacts and effects.

Examples of AQIs to be used to assess the air quality in urban areas and on the regional scale is presented below in priority sequence. These indicators should be independent upon the measurement methods. However, it is important to bear in mind the data collection requirements (see ch. 2.2.1).

3.1.1 Urban and industrial air pollution

First priority

SO_2, measured at locations representative for one-kilometre scale pollution levels with continuous monitors. 1 h averages should be recorded in the data base for estimates of 24 h- and 6 months averages.

NO_2, measured at locations in streets, along roads and on kilometre scale, with continuous monitors. 1 h averages should be recorded for estimates of 24 h averages. (It might be useful to estimate NO_2/NO_x ratios if NO_x data are available.)

CO, measured in streets and along roads, with continuous monitors. 1 h averages should be recorded, and running 8 h averages should be estimated.

PM10 measured on locations exposed to long term impact with two stage filter (impactor) samplers. Particle diametre cut off should be 10 μm and 2,5 μm. 24 h averages should be collected.

Second priority

Black smoke measured with simple filter samplers based upon 24 h averages.

SO_2 at locations as above, but with 24 h average samplers based upon impregnated filter methods or wet absorption.

NO_2 (as for SO_2 above)

O_3 should be measured on a one-hour average basis both for assessment of photochemical smog formation, and as input for describing the oxidation potential in urban areas.

Aerosols at locations exposed for long term impact, preferably with dichotomous high volume filter samplers based upon 24 h average sampling. Filters should be analyzed for relevant heavy metals, e.g. Pb, As, Cd, Cr. The type and amount of metals will be dependent upon purpose and use. For source receptor modelling a large amount of metals should be analysed. For assessment purposes monthly average values should be adequate.

Dust fall at several locations to measure large falling particles in standard dustfall gauges, for assessment of estetic impact.

3.1.2 Data analyses

Standardized statistical analyses should be performed to assess air quality trends, changes in emissions or impact from spcified sources. The severity of the air pollution problem or the air quality should be specified relative to air quality guidelines or preset levels of classification (e.g. good, moderate, unhealthy, hazardous ....).

The number of hours and days, or percentage of time when the air pollution concentrations have exceeded AQS should be presented. This will also need minimum requirements of the data base completeness. Long term averages (annual or seasonal) should be presented relative to AQS. In the Norwegian surveillance programme the winter average values of SO_2 and NO_2 are presented on maps in percent of the national air quality guideline values.

3.1.3 Regional air quality

First priority

O_3 should be measured continuously in remote areas on a 1 h average sampling basis. 7 h average daytime concentrations should be estimated especially during summer seasons for consideration of potential forest and crop damage or degradation.

Acid aerosols included the components SO_4^{2-}, NO_3^-, NH_4^+ should be measured with 24 h average filter samplers as a basis for assessment of critical loads (impact on freshwater, forests and materials).

NO_2, SO_2, HNO_3, NH_3 should be measured on a 24 h average basis to estimate long term dry deposition for consideration of critical loads.

Precipitation chemistry, included pH, SO_4^{2-}, NO_3^-, NH_4^+, Ca, K, Cl, Na, Mg should be measured on a 24 h basis to assess total deposition (wet and dry) compared to critical loads.

3.2 ONE PARAMETER FOR URBAN AREAS?

In urban areas where air quality monitoring programmes are linked to air pollution modelling for assessment purposes, it might be possible to establish one single urban air quality indicator (UAQI) for each air pollutant. This UAQI will be representative for the situation for the whole urban area. It has to be estimated for each air pollutant. These UAQI numbers can directly be used for intercomparisons between different areas and different countries. It will also serve as a simple factor for trend analyses, to assess improvements of impact to the population.

To obtain these UAQI numbers, the monitoring programmes have to be supported by air quality dispersion models. Emission inventories and population distributions have to be established. The monitoring programme can be used in statistical optimization analyses to improve the model results. Air pollution concentration distributions for each relevant pollutant can be used to estimate exposure numbers. The UAQI can then be presented as:

a) Number of people exposed to the specific air pollutants exceeding a guideline value (based upon health effects).
b) The area covered by concentrations exceeding a certain value known to give impact to vegetation or materials.

This approach can be further developed, but will depend strongly upon modelling capabilities.

4 EXPERIENCE FROM NORWAY

Different classifying systems have been applied in Europe for different purposes. The most commonly known systems have been used for alarm reasons for instance in Germany and the Netherlands. The air pollution levels selected for these purposes represent high concentrations, far above the air quality criteria as proposed by WHO. They also have included warning systems.

A different classifying scheme has been applied in Norway for:

a) Classifying the state of the air quality in the largest urban areas of Norway.

b) Information and forecast of daily air quality in Oslo.

Systems for information and forecast of air quality have also been established in Copenhagen, Denmark and in Gothenburg and Stockholm, Sweden.

The main basis for the classification schemes applied in Norway has been the proposed air quality guidelines for Norway (SFT, 1982) and the Air Quality Guidelines for Europe (WMO, 1987). The Norwegian guidelines are presented in Table 3.

Table 3: Air quality guidelines proposed by a committee established by the Norwegian State Control Authorities (SFT) in 1978.

Pollutant	Measurement unit/method	Effect on	Averaging time				
			1 h	8 h	24 h	30 d	6 months
Sulphur dioxide (SO_2)[a]	$\mu g/m^3$	Health			100-150		40-60
Suspended particles[a]	"				100-150		40-60
Sulphur dioxide (SO_2)	"	Vegetation	150		50		25
Nitrogen dioxide (NO_2)	$\mu g/m^3$	Health	200-350		100-150		75
Carbon monoxide (CO)	mg/m^3	Health	25	10			
Photochemical oxidants	$\mu g/m^3$	Health	100-200				
" "	The ozone content measured	Vegetation	200				
Fluorides[b]	μg F/m^3	Health			25		10
" [b]	" "	Animals				0,2-0,4[d]	
" [c]	" "	Vegetation			1,0		0,3

a) Assuming that both compounds are existing simultaneous (synergistic effects)
b) Total fluorides
c) Only gaseous fluorides
d) Based upon deposition to pasture (grass), and a maximum content of fluor of 30 mg per kg dry grass.

Impact on human health, animals and vegetation have been considered for the establishment of the Norwegian guidelines. The guidelines are at present under revision.

The data background for these analyses has been the measurements performed by NILU for the State Pollution Control Authorities (SFT) as part of the national air quality surveillance programme. Statistics on these data are presented in quarterly and annual reports. Air quality trends and frequency of occurrance of concentrations exceeding AQG are presented in these reports. Examples of such presentations are presented in Figure 1.

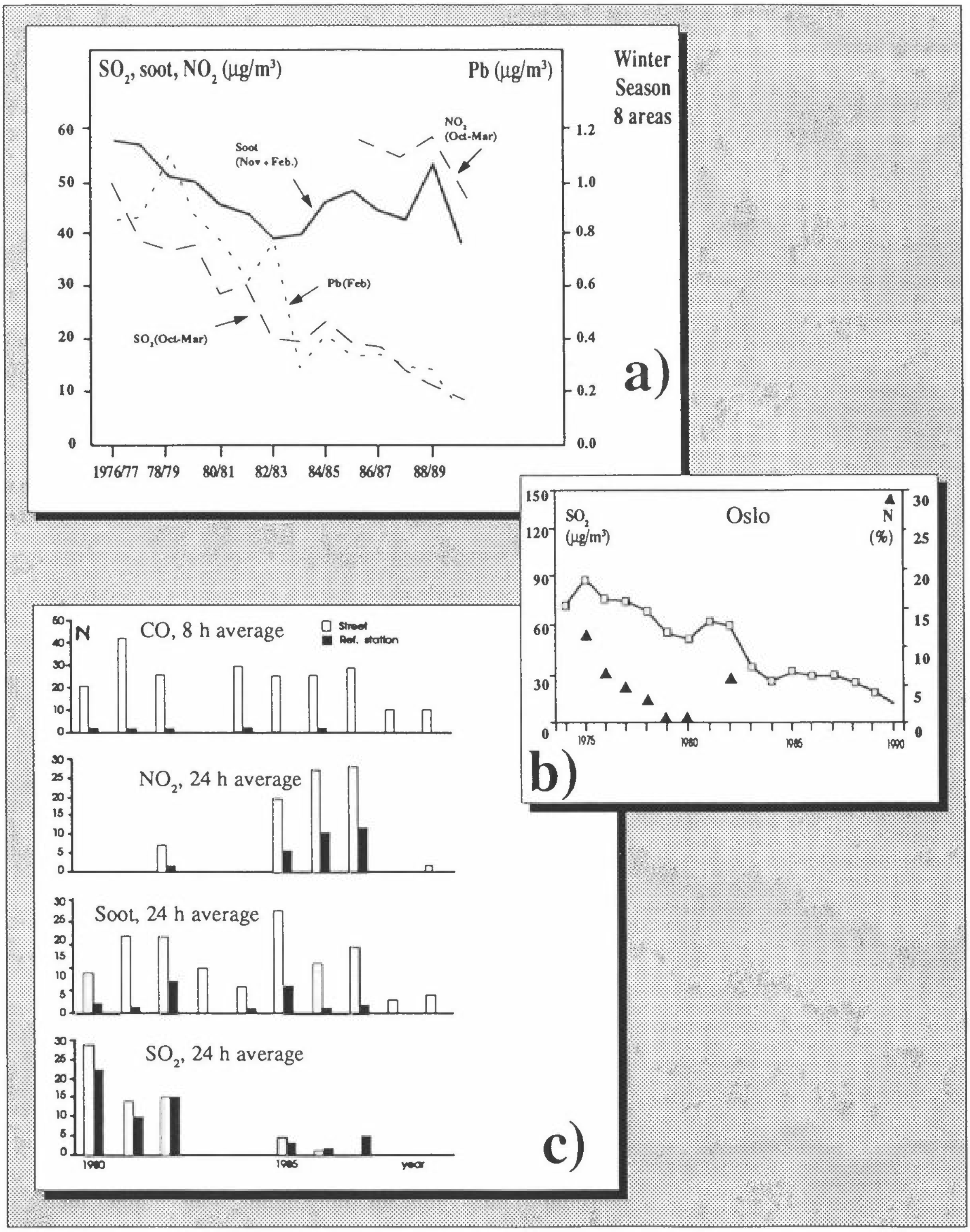

Figure 1: Examples of presentation of data from the Norwegian air quality surveillance programme:
a) Trends of 6 months winter average concentrations from 8 selected urban areas for soot, NO_2, SO_2 and lead, 1976-89.
b) Trends and frequency of exceedance of AQG for SO_2 in Oslo (1973-90).
c) Number of days with exceedance of AQG at two sites in Oslo for CO (8 h), NO_2, soot and SO_2 (24 h) (1980-89).

4.1 AIR QUALITY CLASSIFICATION FOR URBAN AREAS IN NORWAY

The classification was performed in two steps. In 1986 54 urban and industrial areas were analyzed (Hagen and Scjoldager, 1986). The last study carried out in 1989 (Hagen 1989) concidered three air pollution compounds and ten city areas. The air pollutants included SO_2, soot (black smoke) and NO_2. The classifying criteria were based upon the proposed Norwegian air quality guidelines.

Possible atmospheric corrosion problems and potential vegetation damages were taken care of by lowering the 6 month average SO_2 criteria below those related to health.

Also other trace elements and organic carcenogenic air pollutants linked to high concentrations of soot have been taken into account by lowering the 6 month average soot criterium to 20 $\mu g/m^3$.

The classifying criteria are given in Table 3.

Table 3: Classification criteria for Norwegian urban areas.

Compound	Effect on	Average time	Criterium
SO_2	Health Materials Vegetation	24 h 6 months	100 $\mu g/m^3$ 20 "
Soot	Health	24 h 6 months "	100 $\mu g/m^3$ 40 " 1) 20 " 2)
NO_2	Health	1 h 24 h 6 months	200 $\mu g/m^3$ 100 " 75 "

1) Upper limit, 2) Lower limit

The criteria are considered exceeded if one of the limits have been exceeded. In this classification scheme the ten cities were divided into two categories:

a) "moderate polluted" (criteria not exceeded)
b) "polluted" (criteria exceeded)

The two classes were presented for each individual compound. In cases where measurement data can be combined with emission inventories and simple air pollution model estimates, it is possible to indicate the area exposed to pollution exceeding the classifying criteria. An example from Oslo is shown in Figure 2.

In areas where the criteria were exceeded, an estimate of the number of people exposed was also presented. In the example for Oslo about 15.000 persons were exposed to SO_2 concentrations exceeding the criteria. In this way it has been possible to define one simple number which gives a comparable indicator for the air quality impact in the different urban areas in Norway.

The air quality classification performed for urban areas has been used by the SFT in their long term planning. It has also been used for selection of areas where more detailed strategy plans are being developed.

The results have been made available to local authorities who have been made aware of their "problems". However, only in very few occations have they directly applied the classification results for planning purposes. The results have, however, in some cases been used for designing monitoring programmes.

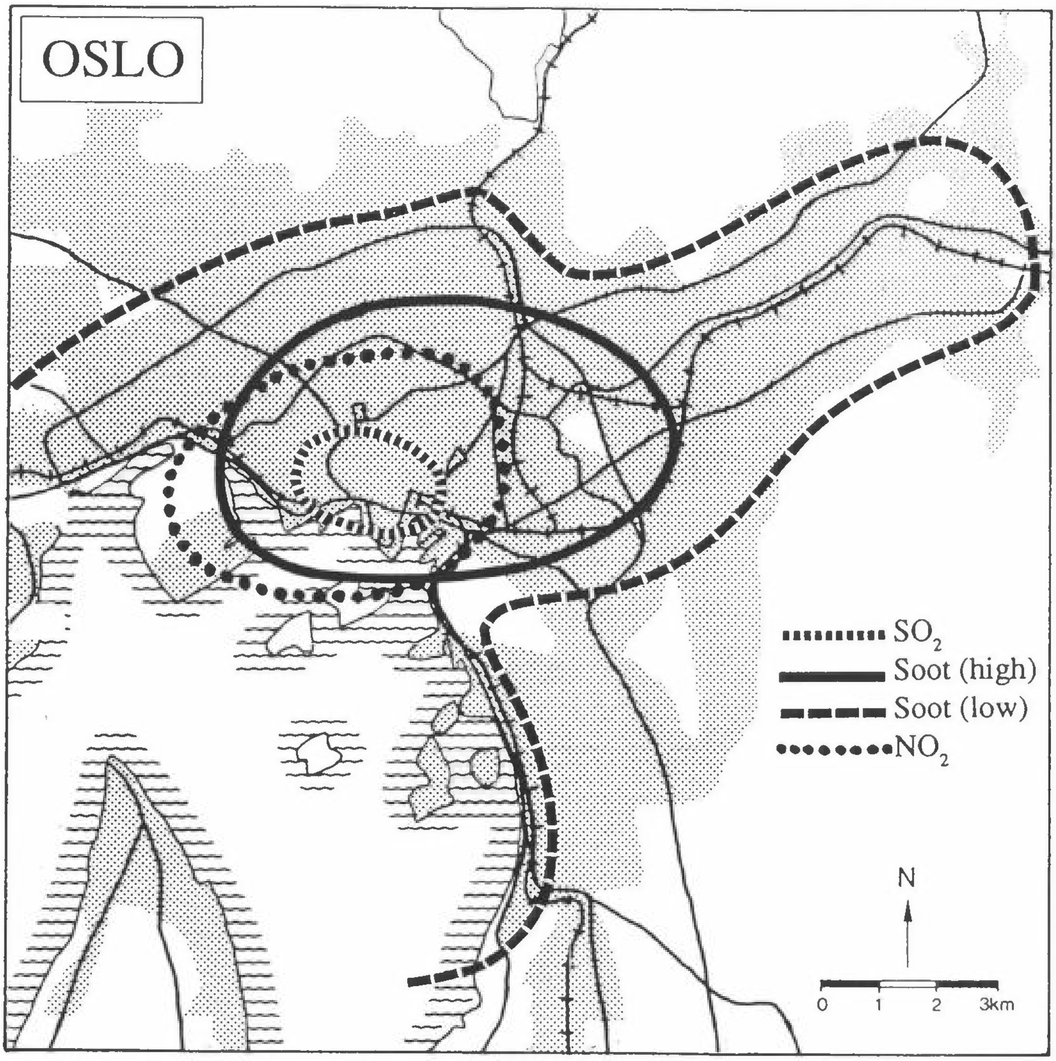

Figure 2: Air quality classification of SO_2, soot, and NO_2 in Oslo, Norway. The areas within lines are exposed to air pollutants exceeding the criteria in Table 2.

4.2 AQIs USED FOR A ON-LINE INFORMATION SYSTEM IN OSLO

The on-line continuous air pollution monitoring system in Oslo has been used to issue daily information and forecast of air quality through the local radio stations.

Four monitoring stations in Oslo were measuring several different air pollution parameters. One hour average and 5 min. peak concentrations of NO_x, NO_2, CO and O_3 together with meteorological variables were automatically transmitted via telephone lines to NILU, located 20 km outside Oslo. 24 h samples of soot, SO_2, PAH and heavy metals were also collected. These were, however, not included as AQIs in the information system.

The selection of AQIs was based upon several years of experience in air pollution analyses in Oslo. Ten years ago or more, SO_2 and soot used to be the main air quality problem in Oslo, especially due to heating with oil and wood during cold winter days. A gradually switch from fossil fuel to use of hydro electricity also for heating purposes has decreased the SO_2 concentrations to winter average levels far below the air quality guidelines. Traffic has, however, increased to become the major air pollution problem. NO_x, NO_2 and CO concentrations might therefore during low wind conditions with surface based inversions cause exceedance of the AQGs. Ozone was added to the list of parameters to explain local NO_2 formation. Ozone data from outside Oslo were also used for estimates of the oxidation potential, but was not included in the classification scheme (the AQIs).

A committee was selected to propose criteria, limits and the type of information to be issued. The discussions lead to three classification levels:

- low air pollution level (good air quality)
- medium to moderate air pollution
- high air pollution level (bad air quality)

The limits for low and high levels were discussed based upon the Norwegian proposed air quality guidelines and the WHO air quality guidelines. The medical representatives in the committee wanted to focus on the potential impacts on health to the most sensitive part of the population.

The most "critical" averaging time was also discussed. The impact on air quality from traffic emissions is varying during the day. The rush hour peak concentrations are usually 3 to 5 times higher than the diurnal average concentration. The best selection of AQIs would therefore has to be based upon 1 h average concentrations.

The final descissions and choice of AQIs in Oslo based upon 1 h average concentration data is shown in Table 4. The criteria for classification levels are also included.

Table 4: Air pollution criteria for information and forecast purposes in Oslo, based upon 1-hr average concentrations.

	Air quality indicators for Oslo		
Air pollution level	NO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$ as NO_2)	CO (mg/m^3)
Low	< 200	< 800	< 10
Medium	200-350	800-1400	10-25
High	> 350	> 1400	> 25

The exceedance of one of the compounds was sufficient to indicate high levels of air pollution.

This means that if concentrations were for NO_2: 180 $\mu g/m^3$; NO_x: 900 $\mu g/m^3$ (as NO_2) and CO: 8 mg/m^3 the information issued would be that "the air pollution level in Oslo is at medium". In this case the NO_x concentration was the limiting parameter.

5 CONCLUSION

The final choice of AQIs will depend upon a variety of factors. The intended use of the results will decide the selection of indicators included compounds and averaging times.

One meaningful single AQI cannot be developed, which combines different air pollutants and different air quality impacts.

For monitoring the development, tracking trends and emission changes, it will be possible to establish a set of indicators. For intercomparisons of different areas it might be possible to establish a first priority list of indicators which can be used for all areas. However, this list of indicators have to be based upon an assumption of a typical composition of source categories present in all of these areas (e.g. power production, heating and traffic). The impact from specific industries will usually not be covered by these indicators.

The establishment and use of AQIs will always be dependent upon the representativeness of the monitoring station locations and the quality of the data. To obtain one AQI which is representative for the whole area measurements of air quality and meteorology have to be linked through emission inventories to the use of air pollution dispersion models. For long term average estimates (months or more) these models can be simple multiple source Gaussian type statistical models. In this way it will be possible to obtain exposure numbers for each air pollutant, e.g. the number of people exposed to concentrations above air quality guidelines. These numbers established for different areas (and different pollutants) can be used for:

- Intercomparison of the severity of the air pollution problems in different areas,
- simplified trend analyses for each area and compound,
- ranking of measures to undertake for reducing the air pollution impact.

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TITLE
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ABSTRACT
The report was prepared for the WHO/OECD workshop on Air Quality Guidelines for Control strategies in Western and Northern Europe and include the background for selection of Air Quality Indicator (AQI). Based upon the experience gained from Norway it is concluded that one meaningful single AQI can not be developed, which combines different air pollutants and different air quality inputs. The problems of representativity might be solved by combining air quality measurements with modelling.

* Kategorier:	Åpen - kan bestilles fra NILU	A
	Må bestilles gjennom oppdragsgiver	B
	Kan ikke utleveres	C